

The bioinformatics lab

- Databases and SQL -

Outline

- Presentation of results from last week
(Connectivity: VPN, (V)LAN, firewall, IDS, networking)
- Short presentation about MySQL
- Starting the programming challenge

Announcement

- special practical: 2010 / 06 / 28
- 'Computer Clusters and External Services'
- guided tour in the LRZ to see all the server and services in live operation
- we meet at 2 p.m. in the rostlab!
- a photo identification is required



Presentation of results from last week

- Connectivity: VPN, (V)LAN, firewall, IDS, networking
- Manfred Roos

Relational Databases

- A relational database provides a way of storing, querying, and manipulating large amounts of data
- A database contains multiple tables, in which data are stored. Each table contains records (rows) and fields (columns)
- These tables relate to each other based on values in a particular column

Relational Database Rules

- Each table is a set of columns and rows that describe multiple instances of something
- Each field (column) must contain a unique type of data in a specific format
- Each row represents one unique record (tables cannot contain duplicate records)
- Each table must contain at least one field with completely unique values to identify a record (row), and so that this record can be related to data in other tables (a key)
 - Keys are usually numeric for flexibility and speed
- NULL values are allowed when data are not known or not relevant. Zeros are not the same as NULL
 - Keys cannot be NULL

RDBMS

- A relational database management system (RDBMS) is a database management system (DBMS) that is based on the relational model
- List of RDBMS:
 - 4th Dimension * Adabas D * Alpha Five * Apache Derby * BlackRay * CA-Datcom * CSQL * CUBRID * Daffodil database * DataEase * Dataphor * DB-Fast * Derby aka Java DB * ElevateDB * Empress Embedded Database * EnterpriseDB * EffiProz * eXtremeDB * fastDB * FileMaker Pro * Firebird * FrontBase * Gladius DB * Greenplum * H2 * Helix database * SQLDB * IBM B2 * WCE SL Plus * IBM DB Express-C * Inormix * Ingres * InteBase * InterSystems Caché * Kognitio * Linter * MaxDB * Mckoi SQL Database * Microsoft Access * Microsoft Jet Database Engine (part of Microsoft Access) * Microsoft SQL Server * Microsoft SQL Server Express * Microsoft Visual FoxPro * Mimer SQL * MonetDB * mSQL * **MySQL** * Netezza * NonStop SQL * Openbase * OpenLink Virtuoso (Open Source Edition) * OpenLink Virtuoso Universal Server * Oracle * Oracle Rdb for OpenVMS * Panorama * Pervasive * **PostgreSQL** * Progress 4GL * RDM Embedded * RDM Server * The SAS system * Sav Zigzag * ScimoreDB * SmallSQL * solidDB * SQLBase * SQLite * Sybase Adaptive Server Enterprise * Sybase Adaptive Server IQ * Sybase SQL Anywhere (formerly known as Sybase Adaptive Server Anywhere and Watcom SQL) * tdbengine * Teradata * TimesTen * txtSQL * UniData * UniVerse * Valentina (Database) * Vertica * VistaDB * VMDS * XSPRADA

Structured Query Language (SQL)

- SQL is the language used to work with modern relational databases
 - It provides the programming syntax (language) to communicate with (query) the database and its tables
- Like English, an SQL statement is made up of subjects, verbs, and predicates
 - “SELECT * FROM state WHERE stateid = 32”

MySQL



- MySQL is a relational database management system
- runs as a server providing multi-user access to a number of databases
- The MySQL development project has made its source code available under the terms of the GNU General Public License, as well as under a variety of proprietary agreements
- Free-software projects that require a full-featured database management system often use MySQL
- MySQL is also used in many high-profile, large-scale World Wide Web products including Wikipedia, Google and Facebook
- MySQL works on many different system platforms, including AIX, BSDi, FreeBSD, HP-UX, i5/OS, **Linux**, Mac OS X, NetBSD, Novell NetWare, OpenBSD, OpenSolaris, eComStation, OS/2 Warp, QNX, IRIX, Solaris, Symbian, SunOS, SCO OpenServer, SCO UnixWare, Sanos, Tru64 and Microsoft Windows. A port of MySQL to OpenVMS also exists.

MySQL APIs

- All major programming languages with language-specific APIs include Libraries for accessing MySQL databases.
- In addition, an ODBC interface called MyODBC allows additional programming languages that support the ODBC interface to communicate with a MySQL database.

MySQL Administration

- MySQL is primarily an RDBMS and therefore ships with NO GUI tools to administer MySQL databases or manage data contained within.
- Users may use the included command-line tools: `mysql`, `mysqladmin`
- Or download MySQL frontends from various parties that have developed desktop software and web applications to manage MySQL databases, build database structure, and work with data records.
 - phpMyAdmin - a free Web-based frontend widely installed by Web hosts worldwide, since it is developed in PHP and only requires the LAMP stack.
 - HeidiSQL - a full featured free frontend that runs on Windows, and can connect to local or remote MySQL servers to manage databases, tables, column structure, and individual data records.
 - Adminer - a free MySQL frontend written in one PHP script, capable of managing multiple databases, with many CSS skins available.
 - DBEdit - a free frontend for MySQL and other databases.
 - Navicat - a series of proprietary graphical database management applications, developed for Windows, Macintosh and Linux.

Today's programming

- Install and configure a mysql server
 - There should be a database with your name and a user with your name.
 - Only your user should have access to the database from the localhost machine.
- Install phpMyAdmin to provide a nice front-end for users.
- Create your own database and fill a table with some data.
 - For example use PHP or perl!
- See hints and tips in the owiki